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FEATURE ARTICLE: A SPOTLIGHT ON QUARTERLY LABOUR PRODUCTIVITY

INTRODUCTION

This spotlight is designed to assist users in understanding and interpreting published estimates of quarterly GDP per hour worked, commonly referred to as quarterly labour productivity. The spotlight provides an outline of the conceptual framework used in estimating quarterly labour productivity and the difficulties associated with interpretation.

What is productivity?

Productivity is measured as the ratio of output to one or more inputs. The aim of productivity analysis is to understand the drivers of growth in output. Growth in output can occur from the application of more inputs, by utilising inputs more efficiently, or from a combination of both. At a basic level, productivity growth occurs when the volume of output rises faster than the volume of inputs.

Measuring improvements in underlying technical efficiency is the normal aim of productivity analysis. This is better achieved using multifactor productivity (MFP) (a), which takes into account both labour and capital. This measure is only available on an annual basis.

Quarterly labour productivity is a timely series that can be used as an indicator of broader economic trends. However, the level of volatility reduces the usefulness of the estimates and makes the study of longer term trends difficult. Annual labour productivity and MFP estimates are more suitable for this purpose. Due to the volatility of the quarterly labour productivity measure, the latest estimates should not be viewed as an indicator of longer term trends. This is also relevant given the end point problems associated with highly seasonal data.

Labour productivity is simply the ratio of output to labour input, and as such is called a partial productivity measure. One limitation of labour productivity is that it attributes to one factor of production, labour, changes in output attributable to all factors of production. Also, labour productivity takes no account of the amount of capital used by labour, or the changes in capital used by labour. Other factors also affect labour productivity including economies of scale, changes in capacity utilisation, increasing returns to scale, changes due to weather patterns as well as statistical errors.

Labour productivity is published as a key aggregate measure on a quarterly basis in the **Australian National Accounts: National Income, Expenditure and Product** (cat. no 5206.0) and on an annual basis in the **Australian System of National Accounts** (cat. no. 5204.0).

DATA SOURCES

The output measure for labour productivity is the volume of gross value added (GVA), sourced from the national accounts. The labour input measure is the total number of hours worked, sourced from the Labour Force Survey. Total hours worked is derived from the level of employment multiplied by average hours worked per person. The ABS publishes quarterly estimates in index form for the economy and the market sector in trend, seasonally adjusted and original terms.

CAPITAL INTENSITY AND LABOUR PRODUCTIVITY

Quarterly labour productivity is one of several indicators used to better understand economic trends. Labour productivity is a useful measure of economic output per unit of labour, but not of underlying technical progress. MFP provides a better measure of technical progress because it takes into account both labour and capital.

An important aspect not directly captured in any measure of labour productivity is the influence of changes in capital intensity over time. That is, the changes in the amount of capital per worker or per hour worked. Increases in measured labour productivity can occur not only because labour is more efficient, but also from increases in capital. For example, this may be the introduction of labour-saving equipment, which means less labour being required to produce the same output.

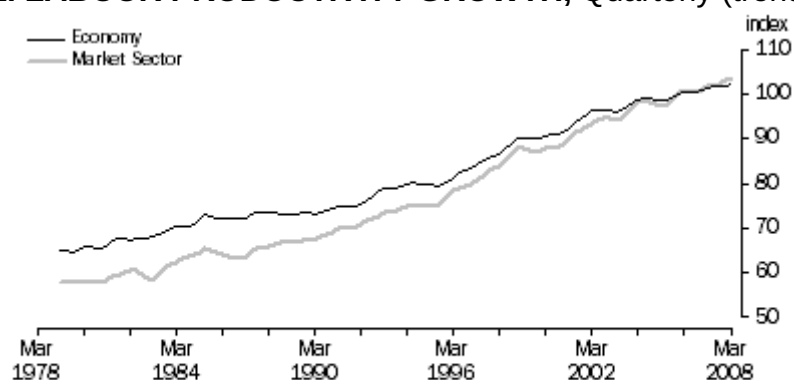
Considering that capital can affect labour productivity, growth in labour productivity is comprised of changes in capital intensity and changes in MFP. Studies have shown that around one-third of the growth in labour productivity can be attributed to the increase in capital per worker, with the other two-thirds attributable to other factors covered by MFP, that is, disembodied technological change (**Eldridge 2005**).

In the long term, many different factors can drive growth in labour productivity. These factors include the introduction of new technology, improvements in the education and training of the workforce, an increase in non-labour inputs relative to labour and labour-saving devices. That is, alongside factors that improve technical efficiency, capital deepening also improves labour productivity, by providing employees with more capital.

INTERPRETATION

Figure 1 shows trend growth in quarterly labour productivity for the economy and market sector. The figure shows that labour productivity growth over the longer term has trended upward. However, as the figure shows, there is some volatility even for trend estimates of labour productivity.

1. LABOUR PRODUCTIVITY GROWTH, Quarterly (trend)



(a) Reference year is 2005-06 = 100.0

Source: Australian National Accounts: National Income, Expenditure and Product, (cat. no. 5206.0)

Figure 1 also shows that labour productivity for the economy growing at a slower rate than for the market sector. This is because output from non-market activities such as government administration cannot be directly measured. Non-market output is estimated by summing the factor inputs. This implies there is no productivity growth in non-market activities.

While labour productivity growth is highly volatile in the short term, there is evidence of long term trends. The drivers of labour productivity growth over the long term are unlikely to alter significantly in the short term, with improvements in systems, technology and training potentially taking significant time to fully implement. Fluctuations in labour productivity growth from quarter to quarter are more likely to reflect movements in capacity utilisation or fluctuations in seasonal factors rather than a shift in underlying technical progress.

Interpreting peaks and troughs in labour productivity

Labour productivity can be a valuable tool for understanding the relationship between output and labour inputs. There are occasional disparities between GDP and labour productivity where labour productivity growth peaks later than GDP growth. There are a number of possibilities as to why this might occur. One possibility is that during a recession, low skilled workers are often the first to leave the workforce, hence labour productivity can actually grow during a recession if employment declines faster than output. The reverse is true during periods of expansion, as it is often the least skilled and least productive workers who enter the workforce last, so labour productivity may slow down or even fall towards the end of an output growth cycle when the employment level peaks as these less productive workers enter the workforce. Further, quarterly data on GDP and employment have peaked in different years, as employment can lag GDP by anywhere up to four quarters (ABS 2005, cat. no. 5206.0, June).

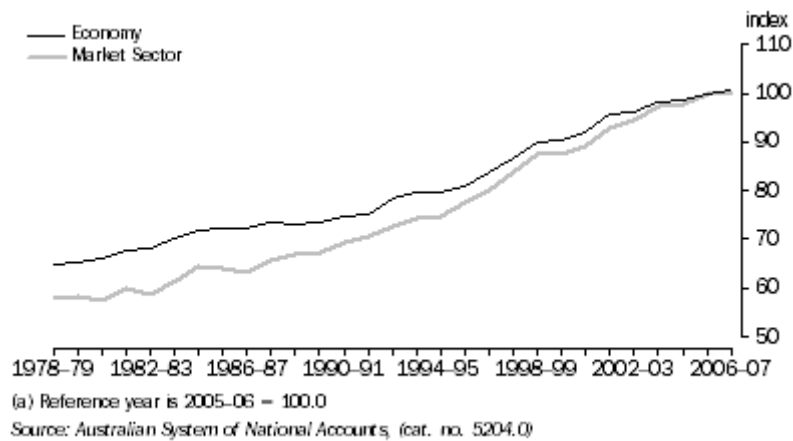
Another possible cause of the disparity between labour productivity and GDP growth is the influence of capital. For example, there may be instances where investment is occurring, but there may be no output because of a lag between new investment and production. This is sometimes highlighted towards the end of an output cycle as capacity constraints, especially in capital intensive industries. Recent experience in the Australian mining industry is one example of this. Growth in output in this industry is being constrained by the construction of new mines and infrastructure which take time to complete.

Labour productivity as an indicator of labour utilisation

Quarterly labour productivity when used in conjunction with employment data could be an indicator of spare labour capacity within the economy. For example, a period of low labour productivity growth combined with high GDP growth may indicate that spare capacity in the labour market is being utilised. However, if there is little or no spare capacity in the labour market, such as during periods of low unemployment, this may lead to unmet demand for labour, and hence rising wage costs to attract labour.

ACCURACY OF QUARTERLY LABOUR PRODUCTIVITY ESTIMATES

2. LABOUR PRODUCTIVITY GROWTH, Annual

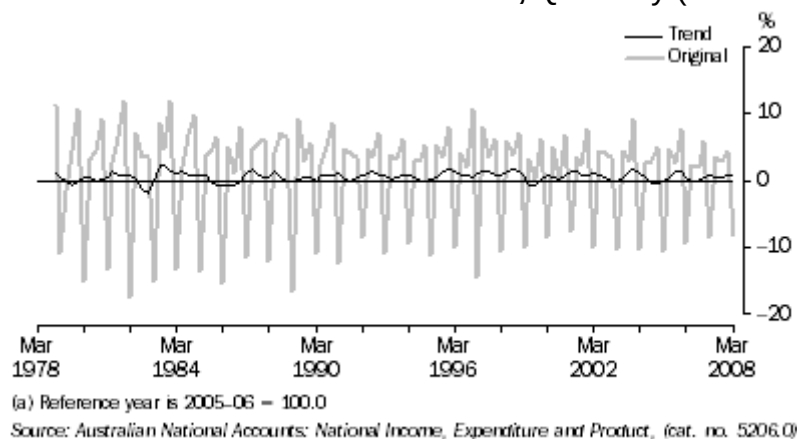


A comparison of annual labour productivity estimates (figure 2) with the quarterly estimates (figure 1) shows the relative stability of the annual measure, with the peaks in the productivity cycle much easier to identify. The figure shows peaks occurring in 1984-85, 1993-94, 1998-99 and 2003-04 and although these peaks are still identifiable in the quarterly estimates, they are less clear. On a peak-to-peak basis, annual average growth in labour productivity is approximately the same irrespective of whether annual or quarterly data are used.

Figure 3 shows the quarterly fluctuations in labour productivity. From the chart it appears that volatility in labour productivity is declining. Quarterly movements can be as high as 10% in the original data, but they are still as much as 2% in trend terms. One of the reasons behind the volatility is that the components of labour productivity, GDP and employment are independent of each other and reflect their own seasonality. This means that these movements will be exacerbated in the labour productivity estimates, creating a highly volatile series.

Figure 3 also shows that seasonal factors can vary considerably, both in the short and long term. The apparent reduction in seasonality in labour productivity since 1978-79 may be a reflection of the changing composition of the Australian economy. Highly seasonal industries such as Agriculture and Retail represent a smaller proportion of GDP than previously, while other industries with different seasonal patterns such as Construction and Mining have become more important. This could be seen as one reason for the decline in volatility. Another reason for the reduction in volatility over time is that there is greater consistency between the constituent series due to better data and measurement techniques toward the end of the series.

3. CHANGE IN LABOUR PRODUCTIVITY, Quarterly (market sector)



There are also other issues concerning the accuracy of labour productivity because of potential revisions to published estimates. For instance, as more comprehensive data become available,

revisions to GDP or hours worked may occur and these impact on labour productivity. One recent example was the changes to hours worked estimates with revisions back to 2001. This had the effect of changing some estimates of labour productivity growth by as much as 0.2%.

SUMMARY

Measuring improvements in underlying technical efficiency, which is the normal aim of productivity analysis, is better achieved using MFP. MFP is conceptually better for analysing underlying growth in productivity as it takes into account all factor inputs, rather than just labour. MFP is not available on a quarterly basis because capital services are not available on a quarterly basis. It is therefore less timely than quarterly labour productivity estimates. This means that growth in labour productivity may reflect changes in capital intensity, which needs to be incorporated into any analysis of the estimates.

Further Information

Further information on this article may be obtained by contacting Paul Roberts, National Accounts Branch on (02) 6252 5360 or email <paul.roberts@abs.gov.au>.

REFERENCE

Eldridge LP, Manser ME and Otto PF, (2005) U.S. Quarterly Productivity Measures: Uses and Methods, U.S. Bureau of Labor Statistics

(a) MFP is published in the Australian System of National Accounts (cat.no.5204.0) on an annual basis.

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